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The Forty-Fourth Annual Report

OF THE

UNIVERSITY OF MARYLAND

Agricultural Experiment Station

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College Park, Prince George County, Maryland

1930-1931

PUBLISHED BY THE STATION

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The University of Maryland Agricultural Experiment Station

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STATION STAFF

Harry J. Patterson, D.Sc., Director.

AGRICULTURAL ECONOMICS.

S. H. DeVault, Ph.D., Agr. Econ.
Ralph Russell, M.S., Assistant.
Paul Walker, M.S., Assistant.
Arthur B. Hamilton, M.S., Assistant.

AGRICULTURAL ENGINEERING

R. W. Carpenter, A.B., LL.B., Engineering
H. E. Besley, M.S., Assistant.

AGRONOMY (CROPS AND SOILS).

†J. E. Metzger, B.S., A.M., Agronomist.
W. B. Kemp, Ph.D., Asso. Agron. (Genetics).
G. Eppley, M.S., Assistant (Crops).
O. C. Bruce, M.S., Asso. Soil Technologist.
R. P. Thomas, Ph.D., Soil Technologist.
E. H. Schmidt, M.S., Assistant (Soils).
H. B. Winant, M.S., Assistant (Soils).
R. G. Rothbeg, Ph.D., Assoc. Plt. Breeding.
R. L. Sellman, B.S., Assistant.

ANIMAL AND DAIRY HUSBANDRY.

DeVoe Meade, Ph.D., Dairy and Animal
Husbandman.
B. E. Carmichael, M.S., Animal Husbandman.
W. E. Hunt, M.S., Associate, Animal
Husbandry.
L. W. Ingham, M.S., Associate (Dairy
Production).
R. C. Munkwitz, M.S., Associate (Dairy
Manufacturing).
M. H. Berry, M.S., Assistant Dairy
Husbandry.
H. L. Ayres, Dairy Mfg.
W. C. Supplee, Ph.D., Assistant Meat Curing.

ANIMAL PATHOLOGY AND BACTERIOLOGY.

E. M. Pickens, A.M., D.V.M., Animal
Pathologist.
R. C. Reed, Ph.B., D.V.M., Pathologist.
**A. L. Brueckner, B.S., D.V.M., Associate
Pathologist.
L. J. Poelma, D.V.M., M.S., Assistant.
H. M. Devolt, D.V.M., Assistant (Poultry).
C. L. Everson, D.V.M., Assistant.
**Alex. Gow, D.V.M., Assistant.
**C. R. Davis M.S., D.V.M., Asst. (Poultry).
**H. T. Bartram, M.S., Asst. (Meat Curing).

* Agent U. S. Department of Agriculture.

† Assistant Director.

** Live Stock Sanitary Laboratory.

BOTANY, PATHOLOGY, PHYSIOLOGY

C. O. Appleman, Ph.D., Physiologist.
J. B. S. Norton, M.S., D.Sc., Pathologist.
C. E. Temple, M.S., Pathologist.
R. A. Jehle, Ph.D., Assoc. Pathologist.
Ronald Bamford, Ph.D., Assistant Botanist.
Glenn A. Greathouse, Ph.D., Asst. Physiologist.
M. W. Parker, M.S., Assistant Physiologist.

ENTOMOLOGY.

E. N. Cory, Ph.D., Entomologist.
H. S. McConnell, B.S., Associate.
Geo. S. Langford, Ph.D., Associate.
L. P. Ditman, Ph.D., Assistant.
Geo. Abrams, M.S. Assistant (Bees).

HOME ECONOMICS

Margaret Coffin, M.A.

HORTICULTURE.

E. C. Auchter, Ph.D., Horticulturist.
T. H. White, M.S., Olericulturist and
Floriculturist.
A. L. Schrader, Ph.D., Pomologist.
S. W. Wentworth, M. S., Associate Pomologist.
*F. E. Gardner, Ph.D. (Assoc. Plant
Propagation).
H. E. Corder, M.S., Assistant Olericulturist.
W. A. Matthews, M.S., Assistant, Canning
Crops.
Paul Marth, B.S., Assistant, Pomology.

POULTRY HUSBANDRY.

R. H. Waite, B.S., Poultry Husbandman.
Geo. D. Quigley, B.S., Associate.

RIDGELY SUB-STATION.

Albert White, B.S., Superintendent.

SEED INSPECTION.

F. S. Holmes, B.S., Inspector.
Ellen Emack, Assistant Analyst.
Ruth M. Shank, Assistant Analyst.
Constance Degman, B.S., Assistant Analyst.
O. M. Farber, B.S., Assistant Analyst.
Olive Kelk, Assistant Analyst.
Elizabeth Shank, Assistant.

The Station is located on the B. & O. R. R., City and Suburban Electric Car
Line and the Baltimore-Washington Boulevard, eight miles north of
Washington, D. C. Bell Telephone—Berwyn Exchange.

Visitors will be welcome at all times, and will be given every opportunity
to inspect the work of the Station in all its departments.

The Bulletins and Reports of the Station will be mailed free of charge,
to all residents of the State who request them.

ADDRESS:

AGRICULTURAL EXPERIMENT STATION,
COLLEGE PARK, MARYLAND.

UNIVERSITY OF MARYLAND

AGRICULTURAL EXPERIMENT STATION

Volume 44

1930-31

THE FORTY-FOURTH ANNUAL REPORT OF THE MARYLAND AGRICULTURAL EXPERIMENT STATION

For Fiscal Year Ending June 30, 1931

By H. J. PATTERSON, Director

To the Governor of Maryland, the Board of Regents, and the President of the University of Maryland:

Gentlemen: In accordance with the requirements of the Federal and State laws, there is presented herewith a summary of the work and activities together with a financial statement as to receipts and expenditures of the Maryland Agricultural Experiment Station for the fiscal year ending June 30, 1931. As in past years there is appended the bulletins issued during the year.

The Agricultural Experiment Station is that division of the University which is charged with the responsibility for conducting research in agriculture for the State. It is the agency, therefore, to which farmers turn for aid when new problems arise.

The fields and number of problems seeking aid through research are constantly increasing.

The application of the results of research has made it possible for farmers to produce more and better at less per unit cost. However, it still remains for improvements to be made in the cost and quality of products and better systems of marketing through collective and cooperative effort.

The appropriations and some of the laboratory facilities for research have increased gradually for several years. Recently the land available for some classes of work has been reduced greatly through the Campus developments required by the growth of the University.

The demands made upon the Experiment Station for additional services, in solving the farmers' problems, which can not always be met makes it apparent that the facilities in men and money for maintenance should be increased if it is to adequately and effectively serve the needs of the State.

The great variety of soils and crops found from the sea to the mountains, 3,000 feet high and 300 miles inland, presents more problems than might be found in many states with a much larger area. Water farming is also presenting problems and demanding attention. Many organizations of the State are requesting aid from the University in conducting surveys and research in connection with various sociological and economic problems. To handle some of these projects will require the services of specially trained men not now on the staff.

FACILITIES AND EQUIPMENT

LAND

The expansion of the University Campus and Athletic fields has greatly reduced the area available for agricultural purposes. The horticultural work has been satisfactorily provided for by the purchase of 268 acres of land about 3 miles north of the University fronting on and east of the Baltimore-Washington Boulevard. This area is gradually being developed for various phases of horticultural work with orchard fruits, small fruits, nursery propagation of ornamental shrubs and trees, market garden and canning crop vegetables. In addition to the work on this farm, many experiments are being conducted in the major fruit and vegetable centers of the Eastern Shore and mountain sections of the State.

More land should be provided at once for other phases of agricultural work. The areas selected and secured should be representative of the type of soil most commonly used for the particular crops to which it is to be devoted.

Poultry Farm:

The Poultry Department will have to be provided with a new location in a few months. The Egg-laying Contest will have to be discontinued November 1st. This department should have about 50 acres to provide for present needs and some gradual future growth. The place selected should be on a well-drained soil with favorable slope and exposure. The location should be reasonably permanent and not likely to be needed for any other purpose in the next 25 to 50 years. There is produced each year over 18 million dollars worth of poultry and eggs. The amount sold brings back to the farm over 12 millions of dollars annually.

Agronomy Farm:

The work with soils, fertilizers, and crops is badly hampered by the lack of sufficient and the proper kind of land. The most forward looking thing which could be done at this time would be to provide 500 to 1,000 acres for these phases of work. The land should be representative of the kinds most generally used for the staple crops. It should be as *uniform* as possible in character, typography, slope, exposure and drainage and free from any artificial influences. Not all of this amount of land would be needed for research at present but the productive index should be obtained so that when new problems come up, at any time in the next 5 to 50 years, requiring plot tests, they could be started under proper conditions. The importance of the staple crops can be realized when it is considered that Maryland devotes annually approximately 500,000 acres to corn, a like amount to wheat, 370,000 acres to hay crop, 90,000 acres to other small grains and over 800,000 acres in pastures. The future and economical production of these crops will depend upon the results of research in their culture, fertilization, selection and breeding of new varieties. The staple crops are basic for the maintenance and development of dairy and livestock husbandry.

Dairy and Livestock Farm:

These divisions of work have very little land and meager facilities. Most of the land now available is rented and might have to be vacated on very short notice.

The dairy industry represents an investment of about 20 millions in animals. They return, in dairy products sold annually, nearly 19 millions of dollars. The horses, beef cattle, sheep and swine on Maryland farms have a value of about 21 million dollars.

Maryland farmers have many problems in connection with the production of milk and meat. These are of interest and value to both the producers and consumers. To solve these problems and to advance these industries will necessitate land and good facilities for these departments. They could use advantageously, 300 to 1,000 acres of land. Such an investment would yield results which would prove very profitable.

Tobacco Farm:

The Station has had leased for a number of years a farm of about 70 acres for tobacco investigations. This farm is located near Upper Marlboro and belongs to the Southern Maryland Fair Association. The investigations are being conducted in cooperation with the United States Department of Agriculture. The facilities for the tobacco work are satisfactory and adequate for the present. These investigations are yielding some valuable and worthwhile results.

The Sub-Station farm at Ridgely in Caroline County is used to supplement the work at College Park and for demonstration purposes.

Seed Production Farm:

The Experiment Station has developed through breeding and selection, new strains and varieties of seed of staple crops, fruits and vegetables. Many of these were superior to the usual varieties in quality, yielding capacity and disease resistance. Lack of facilities and quantity of land prevented carrying the work as far as was desirable or necessary in order to get the seed in sufficient quantity to distribute to the farmers and enable them to profit by it. For the efficient conduct of seed breeding and growing, up to the point when new products could be developed commercially, the Experiment Station should have an isolated tide-water or island farm and also a high altitude mountain farm. Acclimated, good seed is of vital importance in crop production. Success with many crops depends upon having Maryland grown seed. It is not rational to expect the best results with seed grown in different latitudes and altitudes and on soils and under climatic conditions which are very different from those of Maryland. Maryland should be able to grow better seed than could be purchased from distant points and which was grown under conditions very different from those in this State.

Land for Research:

In selecting land for research it is very essential to get the soil types and other conditions which are representatives for the crops to be grown. These factors should be of greater consideration than location. Other things being equal, it is desirable to have the land as near the University as possible, but this should not be regarded as absolutely necessary. Good roads and transportation facilities available today makes it possible to easily reach points which are a few miles away.

BUILDINGS

The main offices and laboratories of the Experiment Station have been located, since its establishment in 1888, in the "Rossburg" Building. During the coming year the offices will be moved into the Agricultural Building and the laboratories to other buildings. Present plans provide that the "Rossburg," built in 1798 for a roadhouse inn, will be repaired and rehabilitated so as to preserve its original colonial architecture and then be used as an alumni, faculty and athletic club. It is hoped that nothing will prevent the carrying out of this idea and plan.

The additions constructed to the Todd Laboratory and their equipment for research in animal diseases has materially improved the facilities for this class of work.

The new horticultural building, now underway, will add greatly to the laboratory, classroom and office accommodations for this department. The equipment of this building should be provided for as rapidly as possible.

Green Houses:

The Department of Horticulture, Botany, Agronomy, Seed Inspection and Entomology should all be provided with additional glass houses in order to carry on their investigations efficiently and economically. In plant breeding, glass houses would make it possible in many instances to produce two to four generations per year instead of only one with outdoor conditions.

Biological Building:

The research work in all of the Biological Sciences—(Zoology, Entomology, Botany, Seed Inspection, Bacteriology, Aquiculture, Fur Farming, and Game Propagation) need more and enlarged laboratory facilities. These would be best served by providing a special Biological Building for teaching and research.

Agricultural Engineering and Farm Mechanics needs more and better laboratories for both teaching and research.

More and better laboratories and equipment should be provided for some phases of Agricultural Chemistry, Dairying, Meats and Animal Husbandry research and instruction.

Some of these things can be supplied in the present Agricultural Building as soon as the space, now occupied by the College of Education and College of Arts and Sciences, is relinquished by providing them with buildings of their own.

Mailing and Storage of Bulletins:

The moving from the old "Rossburg" and adjacent buildings makes it necessary to provide new and more adequate accommodations for the mailing and storage of bulletins.

PUBLICATIONS

During this year one annual report and eight bulletins were published. Funds were not available for publishing all of the results in bulletin form. Details regarding these publications are given in the table below.

During next year the Station bulletins will be mailed regularly to all county and agricultural newspapers, libraries, agricultural institutions, organizations, teachers and investigators. Each bulletin will be abstracted and results summarized in popular language. These abstracts and summaries will be furnished to the press for publication. The bulletins giving the detailed results will only be sent upon special request.

Bulletin Number	Date	Title	Author	Pages	Copies Issued
43rd Report	1929-1930	Forty-third Annual Report	H. J. Patterson	xxii	1,200
321	Sept., 1930	Prices Paid for Maryland Farm Products, 1851-1927	Roger F. Hale	1-206	2,500
322	Aug., 1930	A Production and Economic Survey of the Black Raspberry Industry of Washington County, Maryland	Hugh Ross and E. C. Auchter	207-245	3,000
323	Sept., 1930	Maryland Grasses	J. B. S. Norton	251-326	2,500
324	Jan., 1931	Sharp vs. Dull Ice Cream Freezer Blades and Freezing Efficiency	R. C. Munkwitz & DeVoe Meade	327-342	2,500
325	Feb., 1931	Miscellaneous Feeding Trials with Poultry	G. D. Quigley & R. H. Waite	343-361	3,500
326	May, 1931	Effect of Fall Applications of Sodium Nitrate Upon the Color, Keeping Quality and Nitrogen Content of Apples	W. W. Aldrich	363-405	4,000
327	May, 1931	Peach Rejuvenation Studies in Maryland	A. Lee Schrader & E. C. Auchter	411-441	4,000
328	June, 1931	The Corn Earworm Biology and Control	L. P. Ditman & Ernest N. Cory	443-482	4,000

TECHNICAL PAPERS PUBLISHED IN JOURNALS AND SOCIETY PROCEEDINGS

- Cory, E. N.—San Jose Scale—A Serious Menace. It must be controlled. Twenty-Second Annual Report, Maryland Horticultural Society.
- Cory, E. N.—The Mexican Bean Beetle and the Control of the Red Spider on Strawberries. Trans-Peninsular Horticultural Society, 1929.
- Cory, E. N.—Control Measures for the European Red Mite on Peach and Apple. Trans-Peninsular Horticultural Society, 1929.
- Cory, E. N.—Vegetable Insects of 1929. Report Maryland Agriculture Society, 1929.
- Cory, E. N.—The Mexican Bean Beetle. Published in the Bean Bag, 1930.
- Cory, E. N.—Notes on the European Hornet. Journal Economic Entomology, 1931.
- Cory, E. N.—Beekeeping in Maryland. Maryland Agriculture Society, 1929.
- Cory, E. N.—Insect Invaders. Magazine Section, Baltimore Sun, June 1.
- Cory, E. N.—The Codling Moth Situation. Trans-Peninsular Horticultural Society, 1930.
- Cory, E. N.—The Japanese Beetle. Information Card No. 30, Extension Service.
- Cory, E. N.—Address of Chairman, Quarantine Section, American Association of Economic Entomologists. Fundamental needs in Quarantine, Journal Economic Entomology, 1931.
- Cory, E. N. and Graham C.—The Practicability of Hot Water Treatment for Control of the Boxwood Leaf Miner. Journal Economic Entomology, Vol. 23, No. 3, 1930.
- Cory, E. N., Graham C. and Langford, G. S.—Additional Data on the Hot Water Treatment of Buxus. Journal Economic Entomology, 1931.
- Cordner, H. B. and Matthews, W. A.—Changes in Carbohydrate Content of White Bush Squash During Maturing and Storage. American Society Horticultural Science, 1930.
- Conrad, C. M.—A Furfural-yielding Substance as a Splitting Product of Protopectin During the Ripening of Fruits. *Plant Physiology*, 5:93-103 (1930).
- Conrad, C. M.—Decarboxylation Studies on Pectins and Calcium Pectates. *Journal of American Chemical Society*, 53, 1999 (1931).

- Conrad, C. M.—The Decarboxylation of d-Galacturonic Acid with Special Reference to the Hypothetical Formation of 1-Arabinose. *Journal of American Chemical Society*, 53, 2282 (1931).
- DeVault, S. H., Walker, W. P. and Harvey, D. G.—The Farm Tax Problem in Maryland. Maryland State Grange Proceedings, 1930.
- DeVault, S. H.—Elements of Successful Farming. Proceedings Maryland Crop Improvement Association, 1931.
- Johnston, E. S. and P. L. Fisher—The Essential Nature of Boron to the Growth and Fruiting of the Tomato, *Plant Physiology*, 3:387-392 (1930).
- Pickens, E. M.—A Study of the Effect of Temperature, Age and Shipment on the titre of blood when examined by the Agglutination test for Bang's Disease. *Cornell Veterinarian*, Vol. xx, P. 295, July, 1930.
- Russell, Ralph—Competition in the Vegetable Industry, Proceedings Maryland Vegetable Growers' Association, 1931.
- Sanders, P. D. and G. S. Langford—Investigations on the Control of the Mexican Bean Beetle and the Potato Tuber Moth. *Trans-Peninsular Horticulture Society*, 1930.
- Sanders, P. D.—How to Control the Mexican Bean Beetle. Information Card No. 29, Extension Service.
- Schrader, A. L.—Grape Training and Pruning. *American Society Horticulture Science*, 1930. *Peninsula Horticultural Society*, 1930.
- White, Thos. H.—Effect of Time of Ripening of Bulb on Forcing Qualities of *Gladiolus*. *American Society Horticultural Science*, 1930.

CHANGES IN STATION STAFF

RESIGNATIONS

- E. S. Johnston, Ph.D., Associate in Plant Physiology, resigned to accept position with Smithsonian Institution.
- C. M. Conrad, Ph.D., Assistant in Plant Physiology, resigned to accept position with U. S. Department of Agriculture.
- C. L. Smith, Ph.D., Assistant in Plant Physiology, resigned to accept position with U. S. Department of Agriculture.

APPOINTMENTS

- Ralph Russell, M.S., Assistant in Agricultural Economics.
- Arthur B. Hamilton, M.S., Assistant in Agricultural Economics.
- W. C. Supplee, Ph.D., Assistant Chemist, Meat Curing.
- H. T. Bartram, M.S., Assistant in Bacteriology, Meat Curing.
- H. E. Corder, M.S., Assistant in Olericulture.
- Paul Marth, M.S., Assistant in Pomology.
- W. A. Matthews, Assistant in Canning Crops.
- C. L. Everson, D.V.M., Assistant Pathologist.
- L. A. Black, Ph.D., Bacteriologist.
- Ronald Bamford, Ph.D., Assistant Botanist.
- Glenn A. Greathouse, Ph.D., Assistant Plant Physiologist.
- M. W. Parker, M.S., Assistant Plant Physiologist.
- L. P. Ditman, Ph.D., Assistant Entomologist.
- George Abrams, M.S., Assistant Entomologist (Bees).
- H. E. Besley, M.S., Assistant in Agricultural Engineering.

The following persons have been added to the Staff of the Livestock Sanitary Board, and assigned to the research projects in

animal diseases being conducted cooperatively by that Board, the U. S. Department of Agriculture and this Station:

A. L. Brueckner, B.S., D.V.M., Associate Pathologist.
 Alexander Gow, D.V.M., Assistant Pathologist.
 C. R. Davis, M.S., D.V.M., Assistant Pathologist.
 I. M. Moulthorp, D.V.M., Assistant Pathologist.
 Ruth M. Hays, B.S., Assistant.

TRANSFERS

Mark F. Welsh, M.S., D.V.M., transferred to Maryland Hog Cholera Control.

SERVICES RENDERED FARMERS THROUGH RESEARCH

The Experiment Station Staff renders farmers much help in addition to the results given in published forms through correspondence, personal interviews, special visitations, conferences, addressing meetings of clubs, associations and societies, and popular articles in the press. Also through the diagnosis of animal and plant diseases; identification of insects, plants and seeds; testing the purity and vitality of seeds; determining the lime requirement of soils; preparing and distributing legume inoculums, and animal serums. The following notes will give some idea of the progress made during the year on some of the research projects and some of the special contributions made to help meet and solve the various farm problems:

Agricultural Economics Research:

The business analysis of 267 farms on the Eastern Shore and 270 farms in the Piedmont area have not covered enough years to warrant drawing conclusions, or making specific recommendations but they indicate that the major factors influencing farm profits are: (1) volume of business, (2) kind of crop grown, (3) crop yields—high per unit yields were associated with low per unit costs, (4) the amount and efficient use of livestock kept, (5) efficient use of land, (6) efficient use of man labor, (7) efficient use of power and machinery, (8) relation of expenses to receipts, (9) a judicious combination of crops with regard to soil and markets, (10) a judicious investment in buildings and their efficient use.

The data obtained so far will warrant the recommendations: (1) that farmers should keep simple farm accounts so as to know more accurately the sources of profit and loss, (2) a more careful planning of cropping combinations and the more efficient use of land and labor, and (3) giving more attention to the use of high producing varieties and strains of crops and animals, and thus lower per unit cost of production.

The Farm Layout:

There has not been as much progress made in revising the layout of farms as there has been in re-vamping farm homes. The size and shape of the fields, the location of buildings, lanes and roads, date back to the day of the sickle and scythe.

The efficient use of machinery and the reduction of labor costs in farming in many instances calls for a change in the number, size and shape of fields, for new locations for buildings, fences, lanes and roads.

From a study of 129 farms in this State in the past year, it is estimated that about 90% of the farms could be made more efficient by re-arrangement. It is not recommended that a re-arrangement should be made all at once but a plan should be decided upon and the revision made gradually as conditions make it possible.

This study showed that on farms of 50 acres and less, each laborer cared for 21 crop acres compared to 76 crop acres on farms of 200 acres. The average size of fields on the farms of 50 acres or less was about 6 acres, whereas of the 200-acre farms the fields averaged over 34 acres each. The small farms had a higher investment per crop acre in machinery than the large farms.

Cooperative Associations:

In cooperation with the Federal Farm Board, there was a survey made of the 43 cooperative farm organizations functioning in Maryland. They had a combined membership of 18,600 with a total volume of business \$22,868,000, of which \$19,368,000 consisted of products marketed, \$2,363,000 of supplies purchased and \$1,137,000 of products transported.

The following economic problems are suggested for investigation:

- (a) Local county government.
- (b) Consumers preferences and market demands for specific food products in Baltimore and Washington.
- (c) A study of the poultry industry.
- (d) Credit and insurance problems of Maryland farmers.

Animal and Dairy Husbandry Results:

The results on tests of dull vs. sharp ice cream freezer blades and of the calf feeding investigations have been published as bulletins.

The study of the effect of freezing of milk in its food value has been nearly completed. There was used in the test natural or unfrozen, partially frozen, completely frozen, or milk frozen for 24 hours. The results indicate that freezing of milk did not alter its food value.

A comparison of oat-hull feed with ground alfalfa hay was made in order to test their relative values as emergency feeds in times like the winter of 1930-31. The results showed that the oat hulls cost about one-half as much as the alfalfa hay and produced about the same gains when fed growing heifers.

The electric sterilizer developed in cooperation with the National Rural Electric Project has proven efficient in destroying bacteria on milk cans and pails.

Tests of dry feeds for seven heifers during the summer, when no pasture was available, showed that they made average gains of 1.2 lbs. per day over a period of 90 days at a cost of 13 cents per pound. The ration consisted of equal parts of wheat bran, ground oats, corn meal and one-half part linseed meal with clover hay.

Feeding trials with hogs showed that wheat gave a little better gains than corn. At the prices of wheat in 1931 the cost per pound of gain was also lower than with corn. The feeding value of wheat was increased by the addition of fish meal to the ration.

A comparison of fish meal, soybean oil meal, tankage and dried skim milk as supplements to shelled corn for feeding hogs showed their relative value to be about in the order named above. The cost per pound of gain was highest with the dried skim milk. There was very little difference in the cost of the gains produced with the others. The most economical gains were produced when the hogs ate about 1/3 lbs. per day of the supplement. The details of these feeding experiments, with others, will be issued during the year as a bulletin.

Achievements in Agronomy—Crops and Soils:

On account of the severe drought during the crop season of 1930 yields were low and experimental data in most instances rather unsatisfactory and not conclusive. In some lines of work, however, the results have special value because of the behavior of the plants under extreme conditions. The fertility work was the least satisfactory. The work on winter barley and sugar corn breeding was in some respects very valuable.

Special attention is called to the section pertaining to the farm work and the cost accounting record. Much effort has been given to this phase of the work, in order to give greater accuracy and more definite value to future crop production data. The first use of this cost data will be found in the forthcoming manuscript for a bulletin on "Silage Corn."

All of the work in this department has a more or less direct bearing on the five-year plan for improvement for agriculture in the State. The work in barley, forage crops, sugar corn, and management of soil fertility should be especially valuable in this connection.

Project B-38. Variety Tests of Corn.

Ear Corn.—Corn yields at this station have been low for the past two years. In 1930 the crop was a total failure. Even the small varieties such as Funk's Yellow Dent and Lancaster Sure Crop were not able to mature under the low moisture conditions. The highest yield obtained since 1925 inclusive, was 70.2 bushels for Reid's Yellow Dent. The average yield for all varieties in 1929 was approximately 30 bushels. The highest yield in this same year was 35.8 bushels and the lowest 24.6 bushels. The hard shallow dented varieties like Golden Queen and Thomas seemed to respond better in adverse years than do the deep dented varieties like Reid's and Johnson County White. In fact, Golden Queen should now be considered one of the leading Maryland varieties.

Silage Corn.—Like ear corn, yields of silage corn have been low also during the last five years. Drought conditions affect ear formation more than plant growth. The yields for 1930 were only about 60 per cent as great as the ten year average but they were nearly equal to the State average, which is slightly under 7 tons. The average tonnage of silage corn for the last ten years for the several varieties was as follows: Johnson County White, 8.3; Reid's Yellow Dent, 7.8; Thomas, 9.1; Cocke's Prolific, 9.7; and Eureka, 8.5.

Project B-39. Variety Tests of Wheat.

Variety testing of wheat has progressed to the point where we may consider Fultz, Mammoth Red, Currell, Turkish Amber, and Leap the standard varieties or check varieties. Any new selections or strains with new varietal names can be checked against these and their yielding response determined within a period of two or three years. The following table gives the leading varieties and new strains for the past few years.

Variety	Ave. 10 yrs.	1926	1927	1928	1929	1930
Fultz	29.5	48.2	22.	34.1	26.3	39.5
Mammoth Red	32.1	41.6	21.3	34.2	33.9	42.3
Mammoth R. Sel.	33.2	46.4	21.7	36.5	34.2	42.4
Currell	33.5	48.3	29.1	36.5	30.1	45.3
Currell Sel.		49.6	26.4	40.8	32.2	45.6
Leap	34.0	48.5	24.1	35.9	34.4	45.9
Leap Sel.				37.0	38.8	55.2
Fulcaster	30.3	44.7	21.1	31.5	31.9	43.1
Turkish Amber ...	31.0	44.5	19.4	31.1	33.0	42.8

Wheat yields during the last ten years have been very good, but they have been especially good during the last five years. The year 1926 still stands out as the leading wheat year at this

station. The year 1930 stands second in the list, and 1914 third. Several new selections are very promising as indicated in this report and also in the portion of the report pertaining to breeding and selection.

Project B-40. Variety Tests of Oats.

Three new varieties of oats were put in test in several parts of the State during the year of 1930. This new test is being continued during 1931. Each of these varieties should be better adapted to northern and eastern Maryland conditions than any of the varieties commonly grown. The following table gives the results for 1930 in these tests.

Location	Variety	Bu. per acre	Weight per bushel lbs.	Per cent hull	Lbs. Kernel per acre*
L. C. Mason Big Pool	Fulghum	35.1	26.0		
	Cornellian	60.3	30.5	27.5	1333.4
	Keystone	41.4	26.5	21.2	864.5
D. G. Zentz Thermont	Fulghum	78.0	27.4	30.0	1496.0
	Cornellian	63.4	31.0	27.4	1424.9
	Keystone	61.2	29.6	28.0	1304.3
P. D. Harlan Churchville	Fulghum	41.6	28.0	22.5	902.7
	Cornellian	55.6	27.3	30.0	1062.5
	Keystone	52.2	27.0	32.5	951.3
Frank Lupo Sparks	Fulghum	34.6	27.0	26.5	685.6
	Cornellian	47.6	29.5	29.0	997.0
	Keystone	46.0	28.5	27.0	957.0
Md. Exp. Station College Park	Fulghum	38.6	27.0	26.5	766.0
	Cornellian	40.5	26.0	31.5	721.3
	Keystone	36.2	26.5	29.0	682.0
Average for All Plots	Fulghum	48.2	27.4	26.4	972.0
	Cornellian	53.5	28.9	29.1	1096.2
	Keystone	47.4	27.6	27.5	948.4

Project B-43. Variety Testing of Soybeans.

The soybean yields for 1930 were the lowest on record in this work, the average yield being slightly less than 4 bushels per acre. There are three exceptions, Aksarben, 6.4 bu.; Ito San, 6.5 bu.; and No. 54600, 6.3 bu. This yield when compared with the average yield for the leading varieties for preceding years (approximately 16 bu.) indicates almost a total failure. About twelve new strains have been tested out during the last few years. None of them, however, are superior to Virginia and Wilson No. 5.

* This column represents the calculated pounds of kernel (oat grain without hull) per acre.

Soybean hay varieties, like soybeans for seed, were low also in yield in 1930. For the first time the plot yields dropped below 2 tons per acre. The following table gives characteristic results.

Variety	Average	1926	1927	1928	1929	1930
Virginia	18.4	29.8	20.8	8.6	18.5	3.34
Wilson	17.3	28.0	19.6	13.5	21.7	3.59
Wilson No. 5	13.7	21.9	18.0	19.2	16.6	2.34
Mammoth Yellow	15.4	40.5	25.0	12.1	20.0	3.32
Haberlandt	16.4	27.8	20.4	9.7	14.2	3.49

Project O-29. Effect of Fertilizer Treatments on the Quality of Tomatoes.

The 1930 crop was the lowest in yield since the project was started. The average yield, however, is equal to the normal State yield. Manure and superphosphate treatments lead the list. Manganese in one of the added plots produced good quality of fruit. The per cent of solids is highest for the phosphorus plots. Also, the tomatoes are sweetest during the mid-season.

The yields are as follows:

Plot	Treatment	Tons per Acre				4 Yr. Ave.
		1927	1928	1929	1930	
1	4-8-7	15.76	5.80	6.24	3.64	7.86
2	0-12-0	13.31	4.35	4.89	2.68	6.30
3	Superphos.	6.56	2.26	4.12	2.53	3.62
4	Check	6.75	1.31	4.71	3.52	4.06
5	5-0-0	6.47	2.44	3.33	3.18	3.86
6	5-0-0	5.42	0.66	3.32	3.28	3.17
7	5-0-0	6.98	0.89	4.62	3.43	3.98
8	4-8-7	10.35	3.99	5.86	3.44	5.91
9	0-0-10	9.83	3.59	5.35	3.86	5.65
10	0-0-10	8.86	4.13	6.76	3.44	5.79
11	Manure and Superphos.	13.19	9.58	6.89	4.32	8.49
12	4-8-0	14.63	4.48	6.38	5.28	7.69
13	4-8-0	9.97	2.47	5.28	9.07	6.69
14	4-8-0	8.39	1.56	6.17	3.54	4.91
15	4-8-7	11.92	5.70	6.94	3.44	7.00
16	4-8-7	11.16	4.56	6.41	3.19	6.33
17	4-8-7	11.62	4.60	6.11	3.34	6.42
18	4-8-7	8.18	3.58	7.02	3.74	5.63
19	Check	12.28	3.39	5.59	3.78	6.51
20	0-8-7	12.26	5.17	7.52	4.27	7.56
21	Manure and Rock Phos.	11.81	5.83	6.14	3.59	6.84

Plots 5, 6, and 7 represent sources of nitrogen. Plots 9 and 10, forms of potash. Plots 12, 13, and 14, forms of nitrogen with phosphorus. Plots 15, 16, and 17, forms of nitrogen in a complete fertilizer.

Project O-30. Fertilizer Experiments on Field Corn. (In Co-operation with the Bureau of Chemistry and Soils.)

This work during the 1930 season was in progress at Ridgely and La Plata. The fertilizer treatments are three in number,

duplicated but represent only one ratio, namely 1-3-1. The year 1930 can not be considered satisfactory for corn fertilization tests. There is some similarity, however, between the results obtained at Ridgely and La Plata for the several treatments. The tabulated results are given herewith.

RIDGELY

Plots	Rows	Pounds Per Plot	Corn bu. (70 lb) Per Acre	Fodder Lb. Per Acre	Tons (2000 lbs.) Per Acre
Check	4	30	6.4	137	1.028
1 (3-9-3)	6	73	10.4	247	1.235
2 (6-18-6)	6	77	11.0	266	1.33
3 (9-27-9)	6	64	9.1	254	1.27
Check	4	38	8.1	142	1.065
3 (9-27-9)	6	85	12.1	230	1.15
2 (6-18-6)	6	80	11.4	251	1.255
1 (3-9-3)	6	75	10.7	266	1.33
Check	4	32	6.9	134	1.006

LA PLATA

Corn

Plot	Treatment	Lbs. Per Plot	Bu. Per Acre	Corrected Bu. Per Acre
Check .....	.....	49	5.81	6.15
1	3-9-3	96	11.38	11.67
2	6-18-6	108	12.81	13.43
3	9-27-9	115	13.64	14.74
Check .....	.....	117	13.87	14.83
1	3-9-3	142	16.84	17.48
2	6-18-6	144	17.07	17.56
3	9-27-9	140	16.60	17.07

THE COST OF PRODUCING FARM CROPS

In the production of field crops the cost items may be roughly classified to include fertility, land preparation, seed and planting, cultivation for some crops, and harvesting and storing of the crops. Most of these cost items may be subdivided to include many details. For example, the fertility item may be subdivided into manure, lime, and commercial fertilizer. In addition, there are the items of handling and applying these materials to the land which are important in making up the total cost. In like manner each of the other items may be further subdivided, and in fact should be where detailed cost accounting is desired.

Cost accounting in crop production is an individual farm problem. This is due to the fact that cost items are effected by such factors as size and shape of fields, topography of land, soil type, seasons, the kind and state of repairs of implements, the motive power used, and the efficiency of the management. For these reasons no single set of figures can be accepted as conclusive or applicable to a variety of situations. The figures given in the

following tables as well as all other figures should therefore be used for purposes of comparison, and not for general application to any particular situation other than the one on which they were secured.

COST OF PRODUCING EAR CORN

Summary of Items	Average Cost, 1925-1930	
	Per Acre in Dollars	Per Bushel in Cents
Manure, Lime, Fertilizer.....	11.63	24.0
Land Preparation	3.91	7.9
Seed and Planting.....	1.05	2.1
Cultivation	3.61	7.3
Harvesting and Storing.....	15.55	31.7
Totals	35.75	73.2

Average yield for period—49.02 bushels per acre.

COST OF PRODUCING CORN SILAGE

Summary of Items	Average Cost, 1925-1930	
	Per Acre in Dollars	Per Ton in Cents
Manure, Lime, Fertilizer.....	11.72	0.91
Land Preparation	3.93	0.30
Seed and Planting.....	0.98	0.08
Cultivation	3.22	0.25
Harvesting and Storing.....	14.04	1.09
Totals	33.87	2.63

Average yield for period—12.88 tons per acre.

It will be noted in the tables that nearly one-half of the cost of producing ear corn as well as silage corn is charged against the harvesting and storing. This item is somewhat high perhaps on account of the fact that it includes shredding of the fodder also. The average cost per bushel is too high for 1931 prices but was within the range of profit for each of the other years. The cost per ton of producing silage corn was materially effected by the low yields of 1929 and 1930, due to a severe storm and drought, respectively. The average cost, however, does not seem to be excessive even when the two unfavorable years are included. All of the seed for these tests was purchased. Its low cost should be of special interest in these records.

COST OF PRODUCING WHEAT

Summary of Items	Average Cost, 1925-1930	
	Per Acre in Dollars	Per Bushel in Cents
Manure, Lime, Fertilizer.....	11.06	39.1
Land Preparation	1.49	5.2
Seed and Seeding.....	3.31	11.7
Harvesting, Threshing and Storage of Grain, Baling Straw.....	8.25	29.2
Totals	24.11	85.3

Average yield for period—28.27 bushels per acre.

The item for manure and lime appear in the cost of producing wheat because the total charge is prorated between all of the crops grown in the rotation. All of the manure is applied before preparing the land for corn. The harvesting and threshing costs are somewhat higher than they would be on most farms because they include the expense of baling the straw. The actual cost of the commercial fertilizer used in these tests is only nine and one-half cents per bushel.

COST OF PRODUCING MIXED HAY

(Alfalfa, Alsike Clover, Timothy)

Summary of Items	Average Cost, 1925-1930	
	Per Acre in Dollars	Per Ton in Cents
Manure and Lime.....	8.37	3.75
Land Preparation	2.05	.92
Seed and Seeding.....	5.42	2.42
Harvesting and Storing.....	6.84	3.06
Totals	22.68	10.15

Average yield per acre for period—2.24 tons.

COST OF PRODUCING SOYBEAN HAY

Summary of Items	Average Cost, 1925-1930	
	Per Acre in Dollars	Per Ton in Dollars
Manure, Lime, Fertilizer.....	7.83	3.74
Land Preparation	3.36	1.60
Seed and Seeding.....	4.96	2.36
Harvesting and Storing.....	6.19	2.96
Totals	22.34	10.66

Average yield per acre for period—2.10 tons.

The land was especially prepared for both the mixed hay crop and the soybean hay crop, which increases somewhat the total cost in each case. On the fields planted to mixed hay there were from two to three cuttings each year. The cost per individual harvest on these fields was much lower than for the soybean crop, although the difference between the total cost was not very great. The use of timothy in this mixture is justified on account of the very heavy nature of the soil on the fields. Its presence, however, was not a factor in determining the harvesting date. Since the timothy is immature when the alfalfa and clover is ready for harvest its inclusion does not greatly effect the feeding value of the hay. It should be noted also that only the mixed hay was grown in a rotation with the corn and wheat reported in these tables. In no case is the cost per ton of the hay higher than the farm value for hay of similar quality during the six years from 1925 to 1930 inclusive.

New Projects Suggested:

- (a) The use of *Lespedeza striata* as a pasture and soil improver on the marginal lands of Southern Maryland.
- (b) The growth habits of cereals in relation to climate.
- (c) Rate of increase in crop yields in different regions of the United States.
- (d) Studies on the palatability of Red Top grass.

Maryland Soil Survey:

This year completes the work of resurveying all the counties in Maryland, which present conditions would seem to make necessary. As soon as the reports, which have been prepared, are printed, Maryland will have available, a complete picture of the agricultural soils of the State. The following table gives some data regarding the area and predominating soil types in the counties:

MARYLAND SOIL SURVEY DATA

Counties	Date Surveyed or Re-surveyed	Area of County Acres*	Principal Soil Series and Per Cent of Total Area
Allegany.....	1921	283,520	Dekalb, 68.2; Upshur, 9.8; Franks-town, 6.9.
Anne Arundel.....	{ 1909 1928†	272,640	New report not available.
Baltimore.....	1917	388,480	Chester, 29.0; Manor, 24.2; Hagers-town, 6.2.
Calvert.....	{ 1900 1928†	139,520	Sassafras, 76.0; Meadow, 5.3; Key-port, 3.5.
Caroline.....	{ 1907 1929†	204,160	New report not available.
Carroll.....	1919	286,080	Manor, 51.4; Chester, 23.4; Penn, 15.0.
Cecil.....	1927	241,280	Sassafras, 40.8; Chester, 28.6; Tuxedo, 13.3.
Charles.....	1918	296,960	Sassafras, 49.6; Leonardtown, 26.4; Keyport, 5.3.
Dorchester.....	1922	368,640	Elkton, 49.4; Tidal Marsh, 23.9; Sassafras, 17.5; Keyport, 5.8.
Frederick.....	1919	424,320	Manor, 16.8; Ashe, 14.7; Penn, 13.1; Chester, 8.1; Frankstown, 6.5; Porter, 5.6.
Garrett.....	1922	438,400	Dekalb, 66.7; Upshur, 15.4; Meigs, 5.0.
Harford.....	{ 1927† 1901	282,880	Chester, 35.8; Manor, 19.2; Sassafras, 15.1; Montalto, 12.1; Conowingo, 4.4.
Howard.....	1916	160,000	Chester, 50.5; Manor, 25.0; Congaree, 10.4; Leonardtown, 5.5.
Kent.....	{ 1900 1929†	180,480	New report not available.
Montgomery.....	1914	333,440	Chester, 40.4; Manor, 24.0; Penn, 10.3; Congaree, 7.0; Lehigh, 4.7.

MARYLAND SOIL SURVEY DATA—(Continued)

Counties	Date Surveyed or Re- surveyed	Area of County Acres*	Principal Soil Series and Per Cent of Total Area
Prince George's.....	{ 1901 1925†	308,480	Sassafras, 37.4; Collington, 20.9; Leonardtown, 19.2; Tuxedo, 7.3.
Queen Anne's.....	1907	233,600	New report not available.
St. Mary's.....	1923	237,440	Sassafras, 53.6; Leonardtown, 17.7; Keyport, 12.2; Elkton, 8.8.
Somerset.....	1920	211,840	Elkton, 43.9; Tidal Marsh, 29.4; Sas- safras, 11.4; Portsmouth, 5.7.
Talbot.....	{ 1907 1929†	171,520	New report not available.
Washington.....	1917	293,760	Hagerstown, 44.7; Dekalb, 14.5; Berks, 10.3; Ashe, 4.5.
Wicomico.....	1921	237,440	Sassafras, 28.1; Elkton, 27.4; Key- port, 10.4; Norfolk, 10.3; Ports- mouth, 10.3.
Worcester.....	1924	316,800	Elkton, 26.7; Sassafras, 22.4; Ports- mouth, 16.9; Keyport, 9.1; Nor- folk, 6.6.

* Data from 1930 Census.

† Date of Resurvey.

Bacteriology and Animal Pathology:

The facilities for research in these fields have been greatly increased by more than doubling the amount of space in the Todd Laboratory and adding to the equipment. A house for small animals and another one for large animals has also been added to the plant. The research staff has also been increased by the addition of 4 scientific workers and 3 laboratory helpers. This increase in personnel and facilities has been provided by the Live Stock Sanitary division, that cooperates with the Experiment Station in the research projects.

The major research projects under way relate to the diseases of dairy cattle and poultry; but many other problems receive attention.

A study of temperature, age and shipment on the titre of blood by the agglutination test for Bang's disease shows definitely that blood and serum samples may lose titre when held without refrigeration for more than 24 hours during hot weather.

A study of pasteurization temperatures on (a) *Brucella abortus*, (b) *Brucella abortus* agglutinins in milk indicates very strongly that pasteurization, as sometimes practiced, does not always destroy the Bang organism or the *Brucella abortus* agglutinins. This study should be carried further and would seem to call in some cases for greater care in pasteurization.

Tests of the effect of ozon on cod liver oil indicated that ozonization may destroy vitamin "A", but had little effect on vitamin "D".

This laboratory distributed, during the year, the following biological preparations to the farmers of Maryland:

Hog Cholera Serum.....	138,600	Cubic Centimeter
Hog Cholera Virus.....	540	" "
Tuberculin.....	13,345	" "
Legume Inoculation for 8,434½ bushels of seed.		

Botany, Pathology, and Physiology:

In order to have a better coordination of all phases of work in Botany, the three divisions were consolidated into one department instead of maintaining them as separate departments. It is believed that this will be in the interest of efficiency and economy as well as permit of a growth to meet the demands in this field. Several of the projects listed under Plant Pathology are non-pathological, (J-45, J-46, J-47, J-53, and J-65). The research in Plant Pathology can be classified as follows:

1. Life history and taxonomy of pathogens.
2. Control of crop diseases.
3. Disease resistance of economic plants.
4. Non-parasitic and virus diseases.
5. Diseases of ornamental, florist and forest crops.
6. Diseases of economic grasses.
7. Cereal crop diseases.

The Department of Plant Physiology published in scientific journals, during the year, the results on several projects. (See list on pages X and XI.)

Home Economics Research:

There are two projects under way in this field.

1. Farm housing in relation to labor turnover.
2. Factors affecting the food consumption habits of farming people in Maryland.

On the first project over one thousand farms in five counties were surveyed. The results are being compiled for publication.

Surveys have been made in Garrett, Harford, Anne Arundel and Dorchester Counties in connection with the second project. The results, so far as compiled, indicate that there has been some marked changes in kinds and sources of food during the last ten years.

In addition to the regular projects, this department has given some help in the nutritional surveys made by the Red Cross in connection with drought relief and in procuring some special data for the White House Conference on Child Health and Pro-

tection and the President's Conference on Home Building and Ownership.

The College of Home Economics has cooperated with the Department of Animal Husbandry in the study of factors influencing the palatability of meats and with the Department of Agronomy in the study of the use of flour made from Maryland wheats for cake.

Horticulture:

The results obtained from the experiments with horticultural crops have made some worthwhile contributions in this field.

1. The studies on peach tree rejuvenation conducted in the old orchard on the McNamee farm have shown that with proper methods of peach borer control, the use of nitrogen fertilizers each year, turning under heavy cover crop, moderately heavy pruning and thorough spraying, that such orchards will continue to be profitable at least ten years longer than would normally have been the case. This represents a great financial benefit to the peach industry.

2. The study of the use of nitrates on the color, shipping and keeping qualities of fruit has demonstrated that applications made after the middle of September do not impair the color or keeping quality. The results would seem to favor applying part of the nitrate in the fall and part in the spring in order to secure better growth, better color and promote annual bearing. The contention of some fruit dealers that nitrates injured fruit is unwarranted.

3. The small fruit survey showed the need for better fertilization and indicates that some culture practices are more profitable than others.

4. The studies on the effect of potash fertilizers on fruit gave no marked difference as to color, firmness, or keeping quality.

5. The biennial bearing condition of apples can be partly corrected by the use of nitrogen fertilizers, good soil management, timely spraying, proper pruning, thinning and pollination. Frost and drought will sometimes assist but frequently will upset all other factors of control.

6. The studies on the effects of fertilizers on apple and peach trees indicate that nitrogen has the most marked influence in improving the yields of fruit and the growth of the trees. Other plant foods did not exert much immediate effect.

7. The tests of sod versus tillage have shown that tillage and cover crops gave better results than sod without fertilizer and sod with 5 lbs. of nitrogen per tree. When 15 to 20 lbs. of nitrogen per tree was applied to the sod areas the trees grew and bore as well as the cultivated trees.

8. Fertilizing Strawberries: Field experiments at Pittsville and Marion have been in progress. Results of field experiments are as follows: (1) application of fertilizer in the spring of the year that plants are set is not profitable on soil of good fertility, (2) topdressing with nitrogenous fertilizers in the spring of the fruiting year will increase the yields on the poorer soils, but may seriously decrease yields of the Missionary variety growing on good, fertile soil, (3) heavy applications of lime at time of planting sufficient to satisfy the lime requirement of the soil decreases run-

ner and plant production, and also decreases yields the following spring, (4) topdressing with large amounts of nitrogenous fertilizers delays the ripening of the berries, which may be favorable or unfavorable depending on market conditions, (5) in season of abundant moisture berries grown on plants which have too much foliage are subject to rotting before they ripen. This may result in large losses to the grower, (6) nitrogen increases foliage and size of berries, (7) topdressing in the first fruiting year must be done with caution, especially on certain soils and with some varieties, (8) nitrogenous fertilizers are profitable in the second fruiting year.

9. Influence of Pollination on Fruit Yields: Results show that over two-thirds of the apple varieties grown in Maryland are self-unfruitful. Many pear and cherry varieties are also self-unfruitful. Peaches, with the exception of J. H. Hale and June Elberta, appear to be self-fruitful. Pollenizers recommended for J. H. Hale are: Elberta, Belle of Georgia, and Early Elberta under Maryland conditions. Red Bird, Ray, Fox's Seedling, Brackett and Mayflower will also pollinize J. H. Hale. Some varieties of apples are inter-sterile and cross-incompatible—notably Arkansas x Grimes Golden, and varieties in the Winesap group. Stayman Winesap is self-unfruitful but has an excellent pollenizer in Grimes Golden. Certain varieties are usually good pollenizers such as Yellow Transparent, Delicious, McIntosh, Jonathan, and Grimes. Results indicate that provision should always be made for cross-pollination in case of most fruits.

It is recommended that no variety of apples be planted more than one row removed from a suitable pollenizer, since in unfavorable seasons even self-fruitful varieties will fail to set satisfactorily without cross-pollination.

Delicious and Golden Delicious are self-unfruitful but can be pollinated by several varieties. Delicious has been consistently good as a pollenizer for Golden Delicious.

Melba apparently is self-unfruitful but sets well with McIntosh or Wealthy which bloom about the same time as Melba.

Results of these experiments have been of great value to orchardists in the State since it has meant the difference between no crop and a crop in many cases. Many trees have been top-worked to provide pollenizing varieties for solid blocks. The best methods of top-working have been presented to the growers.

The value of bees in carrying pollen has been clearly shown. In some unfavorable seasons, as in 1929, through lack of bees or insufficient pollenizer trees, many varieties failed to set a commercial crop.

Work is now being directed to new varieties and particularly red bud sports.

10. In tests made in cooperation with the National Rural Electric Project of heating of hotbeds and cold frames by electric current, it was shown that this was a practical means of heating when current was low in cost. The temperature desired for the germination and the growth of plants could be maintained more uniformly by electricity than by manure.

Entomology:

Oriental Peach Moth. This department has conducted work on the oriental peach moth, paying particular attention during the

past year to parasites and the control of overwintering larvae of the pest.

During the past year we cooperated with the U. S. Department of Agriculture in the liberation of *Macrocentrus ancylivorus* and *Macrocentrus delicatus* at six points. The Bureau of Entomology furnished three colonies, totalling 507 adults. 275 were released at Berlin, 113 at Easton, and 119 at Parkhead. We furnished 485 adults. 182 were liberated at Hancock, 190 at Glenburnie, and 113 near Bel Air. This work is being continued.

Experiments with a wide variety of dormant sprays have been conducted and records are being taken on the effectiveness of the dormant oils in the control of larvae spun up in corrugated bands. These results will be available as a guide for work this fall.

In cooperation with the National Rural Electric Project experiments are being conducted to ascertain the effect of light on oviposition of both the oriental peach moth and the codling moth, and field experiments are planned for sprays to protect late apples from oriental peach moth infestation.

Corn Earworm. A report on the corn earworm project, which has been in progress for six years, has been prepared in the form of a bulletin, now in press. A considerable amount of information on the habits of the insect has been obtained and some progress made towards practical control on sweet corn. It is hoped that this work can be continued to a successful conclusion during the coming season.

Much progress has been made on the seasonal history of codling moth and curculio which will enable the planning of a spray service which will be helpful in their control.

The research on the Mexican Bean Beetle, the Boxwood leaf miner, and the potato tuber moth have given encouraging results which give promise of practical means of their control.

The juniper web-worm and the European hornet are recent importations which seem to be gaining in numbers. They do considerable damage in places. Their life history should be studied and methods of control determined.

Poultry:

The sixth egg-laying contest will be completed October 30th. The results are being compiled and analyzed to determine the various factors which can be coordinated with egg production. They give promise of some helpful information. The contest will not be conducted next year as the land now occupied by the contest houses is needed for campus expansion and buildings. A new location and plant must be provided for the development of the teaching and research work.

The control of Bacillary White Diarrhea by good poultry management is yielding encouraging results. The indications point to the development of disease resistant families. The next step is to multiply these and determine their ability to transmit the resistance.

Tobacco:

The extraordinarily dry summer of 1930 interfered considerably with experimental work and the results obtained are necessarily somewhat abnormal.

In the crop rotation studies tobacco black root rot continues to increase in importance as a limiting factor in crop yields where tobacco is grown continuously or in short rotations which include legumes. Liberal use of barnyard manure also has been found to favor development of the disease. The tobacco-wheat-red clover rotation, however, continues to give good results. In order to obtain information as to the cause of good results in yield and especially in quality of tobacco grown on rested land, small plot tests have been undertaken with tobacco grown in rotation with plantings of several of the wild legumes and non-leguminous weeds commonly found on tobacco soils. Definite results have not yet been obtained. In the fertilizer tests nitrate and ammonia nitrogen generally speaking have given about the same results but a combination of the two forms is somewhat better than either form alone. On some soils having a low calcium content, however, ammonia nitrogen is not effective unless calcium is supplied in the fertilizer. Ammonium chloride gives good yields but a poor quality of leaf tobacco. Under ordinary conditions urea has given considerably better results than ammonium sulphate but in the very dry season of 1930 there was a surprising difference in the color, vigor and growth of the tobacco in favor of the ammonium sulphate. This apparently was due to the sulphur supplied by the ammonium sulphate. As regards quantity of nitrogen, best results were obtained with 30 to 40 pounds per acre. With as much as 80 pounds of nitrogen per acre, decidedly better results were obtained when half of the nitrogen was applied as a side dressing at the second cultivation of the crop. While, as a consequence of the exceedingly dry weather, the heavier rates of potash fertilization somewhat retarded the growth of tobacco, the results point to a formula approximating 4-8-12 or 3-6-9 for production of high quality tobacco under average conditions. Encouraging results have been obtained in developing a strain of Maryland Broadleaf highly resistant to black root rot. It is believed that such a type would make possible more intensive methods in tobacco culture.

LIST OF ACTIVE PROJECTS, 1931-32

Agricultural Economics:

- A-13. Economics of the Peach Industry in Maryland.
- A-14. The Marketing of Livestock in Maryland with special reference to Baltimore market.
- A-15. The Supply and Distribution of Maryland Tobacco.
- A-17. Economic Efficiency of the Farm Layout.
- A-18. Organization and Business Analysis of Maryland Farms.
- A-19. The Farm Tax Problem in Maryland.
- A-20. A Quantitative study of the factors affecting the consumption of dairy products in selected areas of Baltimore, Md.
- A-21. Economic Aspects of Farm Tenancy and Leasing Systems in Maryland.
- A-22. A Study of Local Cooperative Associations in Maryland.

Agr. Engineering:

- R-1. Electric treatment of Soils.
- R-2. The Development of an Electric Dairy Utensil Sterilizer.
- R-3. Development of a small dairy pasteurizer.

Agronomy:

- B-38. Corn.
 - A. Variety for grain.
 - B. Corn breeding by selection.
 - C. Hybridization.
 - D. European corn borer.
- B-39. Wheat, Variety tests,
Hybridization.
Head selection and head-to-row tests.
Environmental factors, etc.
- B-40. Oats, Variety tests.
Oats, Variety tests, winter oats.
- B-41. Barley, Hybridization for smooth awns on winter barley.
- B-42. Hay, Forage and pasture, Tests of seed from different sources.
Green manure and soiling crops—rye, vetch, sweet clover.
Botany and culture of vent grasses.
Rates of seeding hay mixtures.
Durability of pasture grasses.
Lawn grass experiments.
- B-43. Annual Legumes.
Inoculation for legumes.
Grasses for hay and pasture.
Variety tests of soybean.
Soybean hay making and composition of soybeans.
Effect of soybeans on wheat yields.
- B-44. Sugar corn.
- B-45. Miscellaneous projects:
Crop Rotation.
The effect of genetic equilibrium and selection upon plant breeding practice.
- B-46. Wormseed culture and fertilization.
- B-47. Studies on the reproductive capacity of the su (sugar) factor in relation to the Su (starch) factor in corn.
- B-48. The effective sex-ratio in corn and its relation to yield.

Agronomy-Soils:

- O-25. The effect of Organic matter on the Fertility of Leonardtown loam.
- O-26. Soil Survey and Management of Maryland Soils.
- O-27. Field Study of the Fertility Requirements and management of Important soil types.
- O-28. Fertilizer studies with early potatoes and sweet potatoes on Norfolk sandy loam.
- O-29. Effect of Fertilizer treatments upon the quality of tomatoes.
- O-30. Field tests of different fertilizers in cooperation with the Bureau of Chemistry and Soils.
- O-31. Soil Fertility studies in relation to tobacco brown root rot.
- O-32. The fertilizer requirements of sugar corn for canning.
- O-33. Efficiency of soil fertility management.

Animal Husbandry:

- C-3. Comparison of fish meal and soybean oil meal as nitrogenous supplements for brood sows.
- C-4. Experiment in hogging down of rye.
- C-5. Data obtainable concerning the rates of gain made by pure bred and by cross-bred pigs.
- C-6. Study of quality of Maryland hams.
- C-7. Comparative study of wether and ram lambs to determine the effect of castration upon the rate and character of production.
- C-8. Survey of Maryland sheep industry and a correlation of the factors which determine the successful raising of sheep.
- C-9. Fitting lambs for market at an early age.
- C-10. The improvement of the market value and carcass quality of thin native lambs.

Biol. Laboratory:

- D-11. Value of tuberculin in the diagnosis of tuberculosis.
- D-12. Tuberculosis in animals.
- D-13. A study of hog cholera.
- D-14. Parasitic infection in swine.
- D-15. A study of forage poisoning horses.
- D-16. A study of blackleg in cattle.
- D-17. A study of Ozone as an auxiliary in ventilation. (Dormant.)
- D-18. A study of disease in cattle due to crab grass.
- D-19. A study of Pyocianus infection in the udder of cattle.
- D-21. A study of the relation of Ozone to disease. (Dormant.)
- D-22. Poultry diseases.
 - A. Coccidiosis.
- D-23. Johne's disease in cattle.
- D-24. To find the lethal dose for poultry of certain drugs commonly used in treatment some of the diseases to which they are subject. (Dormant.)
- D-25. The determination of the best practical methods of limiting infection and reducing exposure in infected herds where more drastic means of control of abortion are impractical.
- D-26. The maintenance of a small reacting herd for the study of contagious abortion.
- D-27. A study of the effects of temperature, age and shipment on the agglutination titre of blood when examined by the Agglutination test for contagious abortion.
- D-28. A study of the methods of transmission of the causative agent of Blackhead in turkeys.
- D-29. A study of the specificity of the Agglutination test for Contagious Abortion.

- D-30. A study of the diseased tonsils removed from children drinking raw milk.
- D-31. A study of the economics of clean and infected herds (contagious abortion).
- D-32. Contagious Abortion—Survey of reacting herds to determine the relation of the titre to reaction to udder infection.

Dairy Husbandry:

- G-3. Establish a system or method whereby contagious abortion may be regulated and controlled.
- G-4. A study of the cost of milk production.
- G-5. Study of the history and development of station herd.
- G-6. Effect of the consistency of the ice cream mix at time of drawing from freezer upon the smoothness of ice cream after hardening.
- G-7. Studying the value of adding vanilla flavoring to chocolate ice cream.
- G-9. The effect of feeding frozen milk upon the development of white rats.

Entomology:

- H-21. Biol. and control of some greenhouse pests.
- H-22. Repelling stable flies.
- H-23. A study of *Laspeyresia molesta* Busck in Maryland (Oriental peach moth).
- H-24. Winter protection of bees.
- H-25. Biology and control of the peach tree borer.
- H-26. Dusting peach and apple trees for the control of insects and diseases.
- H-27. Insecticide Investigations: Sub title: The chemical, physical and insecticidal Properties of pine tar creosotes and some allied products, etc.
- H-28. Methods for the control of the potato tuber moth.
- H-29. Corn ear worm—life history and control.
- H-30. Apple insects—Apple plant lice.
- H-31. The Head capsule of the Soldier termite.
- H-32. Biology of the lesser bee moth.
- H-33. Biology of the larger cabinet beetle.
- H-34. Study of insecticidal properties of pyrothum and its products.
- H-35. Nursery insects.
- H-36. Insecticide investigations.

Floriculture:

- I-17. A study of calyx splitting, carnations.
- I-18. Effect of soil types on yields of varieties, carnations.
- I-19. Breeding and selection snapdragons.
- I-20. Effect of time of ripening of bulb on forcing qualities of gladiolus.
- I-21. Treatment of greenhouse soil in solid beds for
 - A. Zinc poisoning from galv. stakes.
 - B. Toxicity of chrysanthemum roots on sweet peas.
- I-22. Greenhouse crop fertilizers.
- I-23. Dahlia variety testing.

Home Economics:

- R-1. Housing in relation to labor turnover.
- R-2. Factors affecting food consumption habits of farming people in Maryland.

Plant Pathology:

- J-43. Inspection of orchards and nurseries.
- J-44. Annual plant disease survey.
- J-45. Botanical survey of Maryland.
- J-46. Identification of plants.
- J-48. Disease of carnations.
- J-49. Fruit rot sclerotinia.
- J-50. Varieties resistant to disease, tomatoes, clover, peas.
- J-51. Spraying and dusting (cooperation).
- J-53. Maryland trees, botany of
- J-54. Resistance to clover diseases.
- J-55. Effect of chemicals on pollen on heredity.
- J-56. Tomato leaf spot and other tomato diseases.
- J-57. Wilt resistance of tomatoes.
- J-58. Carnation stem rot.
- J-59. Cabbage disease resistance.
- J-60. Root rot of peas, resistance.
- J-61. *Mycosphaerella*.
- J-62. Corn root rot.
- J-63. Peach twig canker.
- J-64. Dahlia diseases.
- J-66. Dusting truck crops for disease.
- J-67. Wheat scab, etc.
- J-68. Tomato mosaic.
- J-69. Tobacco diseases.
- J-70. Blight resistant spinach.
- J-71. Apple scab.
- J-72. Potato seed and mosaic control.
- J-73. Bean Anthracnose control.
- J-74. Small grain smuts.
- J-75. Wheat Septona.

Plant Physiology:

- K-5. The rest period in potato tubers: Field tests on shortening the rest period of Irish cobbler potatoes by treating the seed with Ethylene Chlorhydrin. (Dormant.)
- K-6. A chemical and physiological study of the spindling sprout disease of potatoes. (Dormant.)
- K-7. Physiological and Biochemical aspects of vegetable storage.
- K-10. Physiological aspects of fruit storage.
- K-11. A study of the pectic constituents in tomatoes with reference to quality of the canned product.
- K-15. The relation of light, temperature and atmospheric moisture to the physiological balance in nutrient solutions for plants. (Dormant.)
- K-16. Symptoms of mineral nutrient deficiencies in plants, with special reference to the tomato.
- K-17. A physiological study of the resistance and susceptibility of the tomato plant to *Fusarium* wilt.
- K-18. A physicochemical study of the soluble polysaccharides in sweet corn.

Pomology:

- L-40. The breeding of blight resistance pears, College.
- L-45. Fruit spur and biennial bearing studies of apples, Hancock.
- L-46. The effect of shade on horticultural plants, fruits, vegetables and flowers used, College Park.
- L-47. The effect of varying the length of day on plant growth and chemical composition, College Park.

- L-48. The fertilization of apple orchards, Salisbury, Hancock, Colesville, Berlin, Mt. Airy.
- L-49. The fertilization of peach orchards, Salisbury, Berlin, Mt. Airy and College Park.
- L-50. Sod versus tillage for apple orchards, Hancock and Colesville.
- L-51. The propagation of apple trees on their own roots, College Park.
- L-52. The fertilization of strawberries, College Park, Ridgely, Salisbury, Marion.
- L-53. The effect of bud and spur defoliation on fruit bud formation (peach), College.
- L-54. The influence of pollination of fruit yields, Hancock, College, Salisbury.
- L-55. Experiments in grape training and pruning, College Park, Beltsville and Salisbury.
- L-56. The rejuvenation of peach orchards, College Park and Smithsburg.
- L-57. Peach pruning experiments, College Park, Salisbury and Mt. Airy.
- L-58. The breeding of early colored grapes, College Park.
- L-59. Variety tests of apples, peaches, pears, plums and cherries, College Park.
- L-60. Variety tests of grapes and strawberries, College Park and Ridgely. Bush fruits, College Park.
- L-61. Variety tests of bush fruits, College Park.
- L-62. Transplanting studies with trees.
- L-63. Collection of phenological data.
- L-64. Apple breeding and testing of new seedlings.
- L-65. An economic study of peach cling varieties for canning.
- L-66. An economic study of peach planting distances.
- L-67. A study of factors influencing color in apples.
- L-68. A study of the effect of nitrogeous fertilizers on the keeping and shipping of strawberries, peaches and apples.
- L-69. Studies of nitrogeous fertilizers on orchard fruits.
- L-70. A study of the effect of potash on the keeping and shipping qualities of strawberries, peaches and apples.

Plant Propagation:

- E-1. Vegetable plant propagation.

Poultry:

- M-28. Egg laying competition: Some of the problems being studied in connection with this project.
 Relation of body weight to production.
 Difference in feed consumption, etc.
 Studies in problems of management, etc.
- M-29. Tests of a special method for drying and pulverizing poultry manure as it comes from the dropping boards.

Ridgely Farm:

- S-1. Growing multiplication plats of mammoth red wheat for distribution.
- S-2. The use of fertilizers in the rotation of corn, wheat, hay and tomatoes.
- S-3. Tests with late potatoes, new varieties and seedlings.
- S-4. Variety and fertilizers tests of strawberries.
- S-5. Experiments with sweet potatoes, cantaloupes, multiplication of types.
- S-6. Experiments with garden peas for canning.
- S-7. Tests of varieties of tomatoes and early plants on total yield.
- S-8. The effect of lime with and without fertilizers and manure.

- S-9. Tests of different kinds of lime on alfalfa.
- S-10. Variety tests of corn, wheat and soybeans.
- S-11. Tests of new selections of wheat.

Seed Inspection:

- N-7. Inspection of seeds sold throughout the State each year.
- N-8. Examination of samples taken from seeds sold throughout the State each year.
- N-9. Examination of samples submitted to the laboratory each year.
- N-10. Identification of seeds submitted to the laboratory from time to time.
- N-11. Studies of observed variations among germination tests.
- N-12. Studies of changes in weight of various components of seed samples and the resulting effects on the percentage compositions.

Tobacco Investigations:

- P-1. Tobacco breeding and variety tests.
- P-2. Crop rotation tests with tobacco.
- P-3. Effects of crops on yields of succeeding crops in the rotation with special reference to tobacco.
- P-4. Fertilizer tests and studies in the nutrition requirements of the tobacco plant, with reference to both quality and yield of leaf tobacco.
- P-5. Improved methods of handling seed beds, including steam sterilization.
- P-6. Nutritional deficiency studies.

Vegetable Gardening:

- Q-56. Potatoes:
 - Variety experiments with especial relation as a good late variety.
 - Time of planting late potatoes, Belair, Marion and College Park.
- Q-57. Cabbage and Cauliflower:
 - Methods of growing seed, etc. Conditions affecting heading of late crop of cauliflower, etc. Study of hardness, etc.
 - Selection of mid-season "yellows," etc.
- Q-58. Gardening and canning peas.
 - Fertilizers.
 - Rate of seeding, etc.
- Q-59. Rhubarb:
 - Chemical fertilizers with especial reference to sulphate of ammonia, College Park.
- Q-60. Cantaloupes.
- Q-61. Sweet Potatoes.
- Q-62. General Fertility Problem.
- Q-63. Testing new varieties and strains of vegetables.
- Q-64. A study of Maryland vegetables as to varieties, cultural methods and marketing.
- Q-65. Asparagus.
- Q-66. Spinach.
- Q-67. Tomatoes.
 - A. Breeding selections for canning.
 - B. Influence of green manures and fertilizers.
 - C. Economic value of cultural conditions on yield and quality.
 - D. Rested vs. cultivated and green crops for tomatoes.
- Q-68. Canning:
 - A. Beans.
 - B. Beets.
- Q-69. Changes in the carbohydrate content of squash.

FINANCIAL RESOURCES AND EXPENDITURES

The Experiment Station is maintained by Federal and State appropriations, by sales of farm products and small contributions from time to time for special pieces of research.

The Federal acts outline the functions and lines of work to be undertaken. The State appropriations are for the most part for general and executive expenses and supplementary to the Federal acts.

The Biological Laboratory and Seed Inspection funds are used largely for regulatory work and can not be strictly classed as research funds.

The following table gives the details as to the appropriations and expenditures:

MARYLAND AGRICULTURAL EXPERIMENT STATION
IN ACCOUNT WITH
THE UNITED STATES APPROPRIATIONS, 1931

Dr.		Hatch Fund	Adams Fund	Purnell Fund
To appropriations for fiscal year 1930-31		\$15,000.00	\$15,000.00	\$60,000.00
Cr.	Abstract			
By Salaries	1.....	\$14,473.33	\$13,247.21	\$43,090.41
Labor	2.....	132.50	57.50	5,038.71
Stationery and Office Supplies	3.....	.....	1.65	87.65
Scientific Supplies, Consumable	4.....	57.61	186.00	1,722.17
Feeding Stuffs	5.....	.....	.....	294.47
Sundry Supplies	6.....	.25	46.60	729.30
Fertilizers	7.....	.....	.....	614.29
Communication Service	8.....	44.02	13.72	99.47
Travel Expenses	9.....	115.30	29.34	3,681.19
Transportation of Things.....	10.....	.....	.....	8.00
Publications.....	11.....	171.96	(Omit)	530.85
Heat, Light, Water and Power	12.....	5.03	.....	20.72
Furniture, Furnishings, Fix- tures	13.....	.....	27.20	632.77
Library	14.....	.....	.....	16.78
Scientific Equipment	15.....	.....	1,386.23	1,739.01
Livestock	16.....	.....	.....	120.00
Tools, Machinery and Appli- ances	17.....	.....	4.55	1,524.21
Buildings and Land.....	18.....	.....	.....	50.00
Contingent Expenses	19.....	.....	.....	.....
Balance .....	.....	.....	.....	.....
Total.....	.....	\$15,000.00	\$15,000.00	\$60,000.00

MARYLAND AGRICULTURAL EXPERIMENT STATION
IN ACCOUNT WITH
THE STATE APPROPRIATIONS

Dr.	General Fund	Ridgely Farm
Balance June 30, 1930.....		\$ 164.85
Receipts for year 1930-31.....	\$69,281.73	5,957.46
Total	\$69,281.73	\$6,122.31
Cr.		
By Salaries	\$29,113.43	\$1,920.00
Labor	12,641.87	1,988.56
Scientific Supplies	568.56	16.83
Stationery & Office Supplies.....	303.01	
Feeding Stuffs	10,033.04	356.87
Sundry Supplies	1,862.37	301.71
Fertilizers	1,219.36	289.18
Communication Service	221.58	49.54
Travel Expenses	610.46	249.25
Transportation of Things.....	1,614.58	78.93
Publications	3,875.16	
Heat, Light, Water and Power.....	1,105.89	
Furniture, Furnishings and Fixtures.....	76.48	
Library	433.03	
Scientific Equipment	399.71	
Livestock	997.00	
Tools, Machinery and Appliances.....	1,974.44	1.75
Buildings and Land.....	1,411.16	376.19
Insurance	810.60	
Contingent	82.09	
Muskrat Investigation		444.08
Total	\$69,353.82	\$6,072.89
Overdraft June 30, 1930.....	3,780.68*	
	\$73,134.50	
Overdraft June 30, 1931.....	3,852.77*	
	69,281.73	
Credit Balance June 30, 1931.....		\$49.42
		\$6,122.31

* Due from State Treasurer.

MARYLAND AGRICULTURAL EXPERIMENT STATION
IN ACCOUNT WITH
THE STATION FARM FUND

Dr.	
Receipts 1930-1931	\$24,969.07
Total	\$24,969.07
Cr.	
By Salaries	\$ 1,496.60
Labor	15,518.75
Stationery and Office Supplies	44.17
Scientific Supplies	189.16
Feeding Stuffs	1,852.49
Sundry Supplies	1,770.17
Fertilizers	419.40
Communication Service	91.72
Travel Expenses	139.79
Transportation of Things	254.68
Publications	414.00
Heat, Light, Water and Power	991.71
Furniture, Furnishings and Fixtures	29.40
Library	32.46
Livestock	421.15
Tools, Machinery and Appliances	844.16
Buildings and Land	117.72
Muskrat Investigation	1,077.53
Contingent	38.74
Total	\$25,743.80
Overdraft June 30, 1930	1,879.15
	\$27,622.95
Overdraft June 30, 1931	2,653.88
	\$24,969.07

UNIVERSITY OF MARYLAND EXPERIMENT STATION
IN ACCOUNT WITH
REGULATORY AND PUBLIC SERVICE FUNDS

Dr.	Biological Laboratory	Seed Inspection	State Dairymen's Association
Balance June 30, 1930.....	\$ 1,225.81		
Receipts for year 1931-32.....	12,709.70	\$10,123.55	\$5,409.44
Totals	\$13,935.51	\$10,123.55	\$5,409.44
Cr.			
By Salaries	\$ 3,362.14	\$ 8,392.94	\$4,913.35
Labor	1,484.28	458.31	
Stationery and Office Supplies.....	54.70	208.10	
Scientific Supplies	477.82	282.86	
Feeding Stuffs	358.07		
Sundry Supplies	1,363.95	161.64	
Communication Service	447.21	136.06	
Travel		191.75	171.09
Transportation of Things.....	39.02		
Publications	15.15		
Heat, Light, Water and Power.....	666.66		
Furniture, Furnishings and Fixtures..			
Library		25.85	
Scientific Equipment	592.79	313.16	
Livestock	90.00		
Tools, Machinery and Appliances.....			
Buildings and Land.....	545.15		
Contingent	65.61	10.00	200.00
Total	\$ 9,562.55	\$10,180.67	\$5,284.44
Overdraft June 30, 1930.....		664.63*	350.00
		\$10,854.30	\$5,634.44
Overdraft June 30, 1931.....		721.75*	225.00*
	\$ 9,562.55	\$10,123.55	\$5,409.44
Credit Balance June 30, 1931.....	4,372.96		
	\$13,935.51		

* Due from State Treasurer.

